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and at home. The wealth of illustrations will serve to make identification of common ferns an easy task. (Two of the plates are here reproduced through the courtesy of Mr. Hopkins.)

R. C. B.

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#### THE PROTHALLIA OF OPHIOGLOSSUM AND BOTRYCHIMUM

The prothallia of ordinary ferns are so well known and so easily obtained that the ordinary stages of prothallial growth are matters of elementary instruction in botany. The prothallia of *Botrychium* and *Ophioglossum*, however, are very uncommon and even yet only a few kinds have been found, altogether five species in *Ophioglossum*, and three or four in *Botrychium*. Of these five are fairly well known, the others only incompletely. When it is considered that there is a total of over fifty species in these two genera distributed all over the earth it seems strange that so little is known about them.

Prof. D. H. Campbell, of Leland Stanford University, has given special study to these two genera, and has made extensive trips to the tropics to secure material of them. In Java, he secured good material of *Ophioglossum moluccanum* and *O. pendulum*, as well as of other ferns of interest. He had as long ago as 1892 begun his study of *O. pendulum*, and about the same time of *Botrychium virginianum*. In the intervening time other writers have found and studied *Botrychium virginianum* more completely (Jeffrey), *Ophioglossum vulgatum* and *B. Lunaria* (Bruchman). These five species are really the only ones which are at all thoroughly known, and there are many points about these still to be cleared up. The other species on which a small amount of work has been done are as follows: *B. matricariaefolium* and *B. simplex*, and *O. intermedium*. The list has been given thus completely because our knowledge of the prothallia

of this group of ferns is so small that the finding of the prothallia of any of the species even of those fairly well known, would be well worth notice, especially if the material were in shape for study. It is suggested that if anyone of the readers finds any of these prothallia, they take care to collect them fresh and send them to some university where they can be studied. They may be looked for wherever colonies of plants are found.

Professor Campbell has recently brought together all the results of his and other's studies in connection with a monograph on the whole group *Eusporangiatae*, which includes the *Ophioglossaceae*, and the tropical *Marattiaceae*. (The *Eusporangiatae*; the comparative morphology of the *Ophioglossaceae* and *Marattiaceae*. Carnegie Institution of Washington, Publication 140, pp. 1-229, figs. 1-192, plates 1-13. 1911.) The facts in the present article are derived from the above publication.

The prothallium of *Ophioglossum* as far as known is always a brownish subterranean body, more or less cylindrical in shape. It is also always infected with some kind of fungus without which it seems unable to thrive. Attempts to grow the prothallia from spores have been practically unsuccessful, apparently because none of the fungus was present in the soil used. The prothallia of *O. vulgatum* are reported to be as much as two inches in length. Their general resemblance is to a root, and, Bruchman believes, they may live as long as twenty years. The antheridia and archegonia are born on all sides.

The prothallia of *Botrychium Lunaria* and of *B. virginianum* are flatter and bear the sexual organs only on the upper surface, the antheridia along the middle and the archegonia in two rows alongside. Like those of *Ophioglossum*, they have no green color. In both genera, however, the spores contain some chlorophyll. The prothallia of *Botrychium* are probably at times very

long lived. They have been found attached to fruiting plants of *B. virginianum*.

The writer has found prothallia of these plants twice, once of *B. virginianum* which were buried a couple of inches in the soil of a cedar forest, and one of *B. obliquum*, in a thicket, an inch or so deep. In both cases they were attached to young immature plants and appeared as small tubers. Readers of the JOURNAL are urged to keep careful watch for them especially in the case of the species which have been incompletely studied.

R. C. B.

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The editors have received from Mr. H. H. Tracy, P. O. Box 173, Fullerton, Cal., too late to be printed in full in this number of the JOURNAL, a most attractive outline of a week's camping trip in the Yosemite region which he has arranged for members of the Fern Society. The party will leave San Francisco immediately at the close of the Association meetings on Aug. 7, will go by rail and auto to the Mariposa big tree grove and thence on horse-back, with guides, to Glacier Point, Sunrise Meadows, Tuolumne Meadows, Lake Tenaya, and the head of the Yosemite Falls, descending thence into the Yosemite Valley and spending two and a half days there. The cost of the trip, exclusive of railroad fares to and from San Francisco, will be from \$55 to \$60 per person. Further information may be obtained from Mr. Tracy and members intending to go should notify him not later than July 1st.